

Preface (for CUP)

The IAU Colloquium No. 143 "The Sun as a Variable Star: Solar and Stellar Irradiance Variations" was held on June 20 - 25, 1993 at the Clarion Harvest House, Boulder, Colorado, USA. The main objective of this Colloquium was to review the most recent results on the observations, theoretical interpretations, empirical and physical models of the variations observed in solar and stellar irradiances. A special emphasis of the Colloquium was to discuss the results gained on the climatic impact of solar irradiance variability.

Study of changes in solar and stellar irradiances has been of high interest for a long time. Determining the absolute value of the luminosity of stars with different ages is a crucial question for the theory of stellar evolution and energy production in stellar interiors. Observations of the temporal changes of solar and stellar irradiances - in the entire spectral band and at different wavelengths - provide an additional tool for studying the physical processes below the photosphere and in the solar-stellar atmospheres. Since the Sun's radiative output is the main driver of the physical processes within the Earth's atmosphere, study of irradiance changes is an extremely important issue for climatic studies as well. As recent climatic models show, small but persistent changes in solar irradiance may dramatically influence the Earth's climate. Furthermore, to understand the human effect on global climatic change, the role of irradiance variations (as a significant source of the natural climate changes) in terrestrial and climatic processes must be revealed.

The Colloquium was a historical meeting since this was the first time when a conference sponsored by the International Astronomical Union was entirely devoted to irradiance variations and their climatic impact. 200 scientists from 30 countries participated in this Colloquium. It was divided into six sessions as defined by their key topics: (1) General Reviews on Observations of Solar and Stellar Irradiance Variability; (2) Observational Programs for Solar and Stellar Irradiance Variability; (3) Variability of Solar and Stellar Irradiance Related to the Network, Active Regions (Sunspots and Plages), and Large Scale Magnetic Structures; (4) Empirical Models of Solar Total and Spectral Irradiance Variability; (5) Solar and Stellar Oscillations, Irradiance Variations and their Interpretation; and (6) The Response of the Earth's Atmosphere to Solar Irradiance Variations and Sun-Climate Connections. A special 1-day session of the "Solar Electromagnetic Radiation Study for Solar Cycle 22" (SOLERS22) was held on June 25, 1993, where the five working groups discussed their progress and future plans on measuring the absolute value of total solar and spectral irradiances and studying their temporal variations.

There were 36 invited talks and 110 contributed poster papers presented at the Colloquium. These papers have demonstrated that the solar energy output changes on different time scales: the short-term (from minutes to months) variations are related to surface modulations mainly caused by the evolution of active regions; the solar-cycle-related long-term variations are directly linked with the evolution of magnetic fields over the activity cycle; while the secular variations over centuries are associated with long-term internal modulations. Although considerable information exists on solar-stellar irradiance variations, their physical origin is not well-understood. The lack of adequate physical models of irradiance variations for predicting the solar-induced climatic changes led to extensive discussions of the consequences of the planned delay or even a possible termination of

irradiance observations performed in space. Based on these discussions, the Scientific Organizing Committee released a resolution that addressed this issue to the leaders of the appropriate Space Agencies. The resolution was also forwarded to the General Secretary of the International Astronomical Union by the President of IAU Commission 10.

The proceedings of the Colloquium have been printed in two volumes. This volume contains the invited papers in the order of their presentation at the Colloquium within the listed key topics. The contributed papers have been published separately in a special issue of Solar Physics (Vol. 152, 1994) that will also appear in book format by Kluwer Academic Publishers.

This volume has been edited with a L^AT_EX formatting program released on September 30, 1993 by Alison Woollatt. Ferenc Varadi provided his technical expertise in the L^AT_EX typesetting. The editors invested considerable effort into making the proceedings uniform throughout. We are responsible for any errors that may have been introduced in this process.

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%publications.

Many people and many organizations helped in organizing the Colloquium and making the proceedings ready for publication. We are sincerely thankful to Dr. Jacqueline Bergeron, IAU General Secretary, and Dr. Immo Appenzeller, IAU Assistant General Secretary, for their help and assistance throughout the planning process of the meeting. We would like to take the opportunity to express our gratitude to Dr. Richard C. Willson (JPL, Solar Irradiance Monitoring Group) and Dr. Ernest Hildner (NOAA Space Environment Laboratory) for their continuous support.

We would also like to express our appreciation and thanks to the members of the Scientific Organizing Committee for their support. The Scientific Organizing Committee consisted of Sallie Baliunas, Dick Donnelly, Peter Foukal, Claus Fröhlich (Co-Chair), Vic Gaizauskas, Ernest Gurtovenko, T. Hirayama, Hugh Hudson (Co-Chair), Julius London, Judit Pap (Chair), Paul Simon, Henk Spruit, Béla Szeidl, Jean-Claude Vial, and Dick White. Here we are very sorry to report that Dr. Ernest Gurtovenko died on January 20, 1994. Dr. Gurtovenko headed the Solar Physics Department of the Main Astronomical Observatory of the Ukrainian Academy of Sciences for years and served on many national and international committees. His work gave a significant contribution to the models of solar radiation and he built the space telescope DIFOS to be launched on CORONAS in 1994 for studying the global oscillations of the solar brightness. His hard work as a member of the Scientific Organizing Committee provided a significant help to scientists from the former Soviet Union to attend the Colloquium.

We also wish to express our gratitude to the members of the local Organizing Committee: Pat Bornmann, Peter Fox, Howard Garcia (Chair), Patrick McIntosh, Larry Puga, Gary Rottman, Andy Skumanich, Kent Tobiska (Co-Chair), and Tom Woods for their help and assistance. We are especially thankful to Kent Tobiska, Pat McLane, Helga Mycroft, Liana The, Pam Bergstedt, and Judy McGarvey for all their time and hard work in handling the numerous details necessary for the planning and smooth running of the meeting. The staff of the Clarion Harvest House provided a pleasant environment for the meeting. We also express our gratitude to Liana The, Ferenc Varadii and Virginia White, for their help and time during the process of putting together the conference proceedings.

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Propulsion Laboratory, National Aeronautics and Space Administration, and NOAA Space Environment Laboratory made it possible to carry out this meeting. Travel supports provided by the International Astronomical Union, National Science Foundation, International Science Foundation, and the Department of Energy helped more than 30 scientists from different countries to attend the Colloquium. We are very grateful for the financial assistance of the above organizations.

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